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Filter cartridge assemblies and housings are provided and include a tubular housing having an inner wall, an outer wall, a first end, and a second end. The housings include inner walls with shoulders or other radially-inwardly extending flow directors at the intersections of adjacent sections of the tubular body. The assemblies include a plurality of filter media sections within the housing, and each of the plurality of filter media sections preferably has a different filter media composition. One or more of the filter media sections traverses one or more of the shoulders or other radially-inwardly extending flow directors such that the flow directors evenly direct the flow of fluid through the assembly. The assemblies find particular applicability in dialysis systems.